

Pyrotechnics 58

The Now and Then Newsletter of General Technics

April 1996

Pyrotechnics at Worldcon The Best Gopher Job I Ever Had

Linda Tangalan

On August 27, 1995, I volunteered for what can easily be described as the best gopher job I ever had. I was part of the fireworks crew at the Worldcon in Glasgow, Scotland. Armageddon Engineering, a fireworks company owned by a group of British fans, was putting on a display and they recruited most of the GT members attending the con to be "hewers of wood and drawers of water," as one AE pyrotechnician put it.

It started the night before, when we had a meeting where we volunteered for specific tasks, arranged times, places, etc. Sunday afternoon we showed up at the site from where the fireworks were to be shot, in order to start setting up. The site was on the north bank of the Clyde River, just across a long footbridge from the Worldcon hotels.

"Set-up" was digging holes for the mortar tubes using shovels, pickaxes, rocks—basically anything we could find. As we were digging, some of Scotland's finest pulled up, and began speculating as to what we were doing digging around in this big empty field. ("Empty" is a relative term; the ground seemed to consist almost entirely of rocks and pieces of demolished buildings.) The police

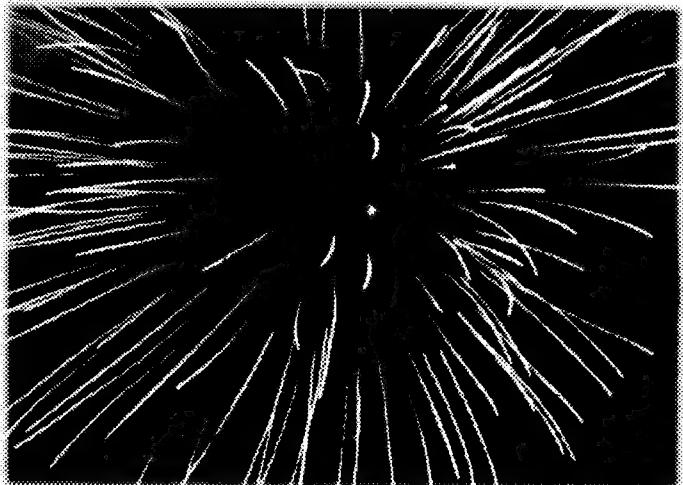


PHOTO: RUTH ANN NICHOLS

Aaahhhhhhhhhhhhhhh!

had decided we must be on some sort of treasure hunt, when Dermot Dobson went over to assure them that we had permission to be there. I don't know if that was true, but the officers seemed to believe it, or at least, they let us continue digging.

Another crew, led by Linda Stratmann and Gail Bondi, worked on the lancework, which was lit during the finale to display the "CREED" logo. Creed is a horror publishing company in the U.K., and are the fine folks who sponsored the fireworks display.

Finally, at dusk, the van containing the supplies arrived, and we began unloading, and unloading, and unloading. It was apparent that the dozen or so holes which had been dug that day weren't nearly enough, and anyone who could get ahold of a digging implement, started at it again. By now it was very dark, and the rest of the activities were done by the light of what few "torches" (a.k.a. flashlights) could be found. I had my keylight, but the beam just didn't travel very far in the pitch darkness.

We had several 3-inch and 4-inch mortar tubes, some of which were strapped together in packs of 5 or so, and we just set those on the ground, rather than trying to bury them. We had 5-, 6-, and 8-inch diameter tubes, and yes, one 10-incher, which gave its life to this display. More on that later. Larger, shallower holes were dug for the 60- and 90-shot cakes, of which there were approximately 40 and 20, respectively, and for the 104-shot "Poisonous Spider" which was so large, it required two people to carry it.

Once all the tubes were buried or placed, it was time to

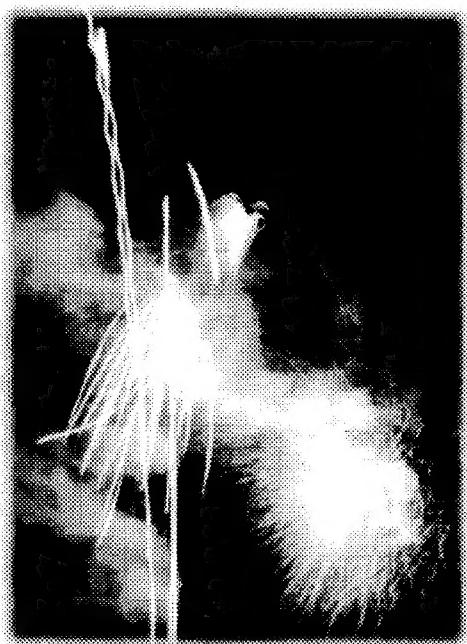


PHOTO: RUTH ANN NICHOLS

Ooooooooooo!

load them, and set the ammo for reloads. When this was done, we broke into 2 groups—one to light, and one to keep an eye on the lighters, keep spectators from getting too close, and make sure there were no stray ashes left burning in the field.

At last, it was time to start!

The lighters were given "port-fires" which were sort of a cross between sparklers and flares. The spotters (Sam Paris, Bonnie Jones, Barry and Jo Gehm) moved to a safe distance. ("Safe" is also a relative term, they discovered.) Ruth Ann Nichols and Andy Morris prepared to record the event with still photos and a video.

Dermot, Hugh Mascetti, Gary Stratmann and Chris Suslowics directed the lighting crew, who included Gail Bondi, Chris Cooper, Bill Higgins, Steve King, Paul MacNerland, Roxanne Meida-King, Kevin Nickerson, Dave Power, Barbara Stewart, Linda Stratman, Erick Wessing, Guy Wicker, and myself. And the fireworks began.

"Bill, light a 5-inch!" Thunk. Whoosh. POW! "Kevin, do a 6-inch!" and on and on the sky lit up over my head.

I believe it was Chris who lit the 104-shot "Poison Spider," which filled the sky with corkscrewing clusters of showering sparks. As it shot shell after shell into the air, he sat next to it, trying to get one of the other cluster-cakes to light. Folks, don't try this at home.

At this point, someone lit the 10-inch shell. It burned, and



Hail, the Conquering Heroes!

PHOTO : COURTESY STEVE & ROXANNE KING

then...nothing. We all watched, to see if something was going to happen. A few sparks spat out of the tube. Someone yelled, "Run away!" We took a few steps, but continued to watch. At which point Barry Gehm bellowed, "Run away FARTHER!" A moment later it went up, and exploded spectacularly in the sky. It was, however a little low for the size of it, and we were all showered by still-glowing embers. As Barry put it, "Now

I know what it feels like to be an ashtray."

Afterward, as we were cleaning up, we dug out the 10 inch tube, and it had a huge hole in the side. We paraded it back to the hotel like a prize kill fresh from the field.

Andy Morris shot some excellent footage of all this, so if you'd like to see it, contact Dermot, or just ask around at any GT party.

Quarks

We goofed. Last issue's "Quarks" column reported that the title of Dawn Kuczwara's instructional videotape was INSERT TITLE HERE. Blame this on Bill Higgins, who was supposed to contact Dawn and put the correct title into Quarks before press time. The correct title is *The Internet Video*. (Upon learning this, another editor asked "Wouldn't INSERT TITLE HERE be a better title?") We toyed briefly with the notion of producing a quickie video starring Dawn and entitled I.T.H., but decided it would be better to 'fess up and print this correction. Meanwhile, Dawn is hard at work on a second production, to be titled FIND OUT THE TITLE AND GET IT IN HERE BEFORE WE PUBLISH—THIS MEANS YOU, BILL!

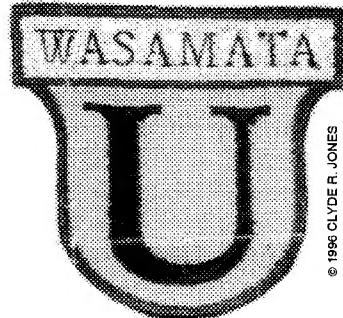
It gives us particular pleasure to announce the birth of Emily Catherine Ifversen on March 16, 1995. (Okay, so she's over a year old now, but better late than never.) Another new Michigan GTer is Adrick Morgan Haas, rushing to beat Microsoft Chicago Windows 4.0 94 95 to the marketplace on the 23rd of August. Bringing up the rear of 1995 was Margaret Catherine Johnston on December 2.

We got to chat with Jamie Hanrahan, erstwhile editor of this publication, when he visited Chicago last June. Over pizza we talked about gadgets and operating systems. Jamie's writing a book on Windows NT.

Long-time Pyro contributor WA8WTE (George M. Ewing) sold a peculiar story to *Asimov's Science Fiction* and it appeared in the January 1996 issue. It deals with a bunch of techies who like to get together at McLain State Park in Michigan's Upper Peninsula, where they Build Interesting Devices and also Set Off Unique Fireworks. One day, there's a bright flash and a piece of the campground disappears. Now read on. (Oh, you wanted to know the title? "Pyros." Hmm...) George has been having serious struggles with the Dark Side of the Postal Forces, who "sent my Ham Radio License to Texas, and claimed that they'd never heard of an outfit called 'Federal Communications Commission' or a place called 'Gettysburg, PA!'" He finally managed to get a letter through to us that mentions another recent sale, this to the Summer 1995 issue of *Satire* magazine: "Galactic Consumer Reviews Large, Dangerous Spacecraft!"

Boy, have we been to a lot of techie weddings lately. George Gordon and Cynthia Webber kicked off the matrimonial marathon (to mix metaphors) on July 1st, 1995. On July 8th Andy Peed and Mary Cruickshank were married, following an exhausting midnight pursuit of a wayward pig-roaster (an item intended for the post-wedding banquet). Also in July, wearing elegant Renaissance attire, Steve King and Roxanne Meida took their vows. In the first week in August Paul MacNerland and Linda Tangalan were married at what has been called by some "The GT event of the year". In October, it was the turn of John Frambach and Julie Hill, whose ceremony was conducted in the historic Berrien Springs courthouse, and was followed by a reception at the Michigan Dunes. A handsome "wedding window" in Dale Sulak and Anita Eisenstein's living room reminds them of their own October celebration, thanks to GT stained-glass wizard Dave Ifversen and a host of well-wishers who commisioned Dave to make it. Congratulations to all the newlyweds. Gotta get this issue out in a hurry, so we'll have room for the consequent wave of birth announcements...

Clyde Jones writes that he's experimenting with embroidery: "patches generated by a teeny tiny CNC machine controlled by my Mac, and a very bad bit of software...you feed in a graphic, then outline and fill areas or designate satin stitch lines, or plunk in one stitch at a time for detail." He sends along a color Xerox of his patches, a delightful array of Elvish runes, logos of long - dead companies, Tibetan chants, SF images, and a Wasamata U. emblem (we think this is Clyde's *alma mater*).



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Todd Johnson was discussing Dermot Dobson's experiments in the medical-imaging business in Oxford. "Dermot called the other day and among other subjects happened to mention that I've spent the last week filling pig's hearts with lime jello.' When I related this to Mary Lynn she wrinkled her nose and said 'I see that British cooking isn't getting any better.'"



ON WINGS OF ALUMINUM A GTer at Oshkosh

Mike Bakula

Wednesday, 26 July 1995

Having spent the morning settling my affairs at work for a week's absence, I begin my trip to the Experimental Aircraft Association's annual Fly-In, at that Mecca of cheese and aviation, Oshkosh, Wisconsin. Starting from downtown Chicago, I thread my way through the afternoon traffic, and proceed up the tollway towards Milwaukee. It's an uneventful drive, punctuated only by a wrong turn in the Milwaukee area, and a crazed Wisconsinite who has apparently noticed the "Darwin footie-fish" on the back of the car. She weaves her green



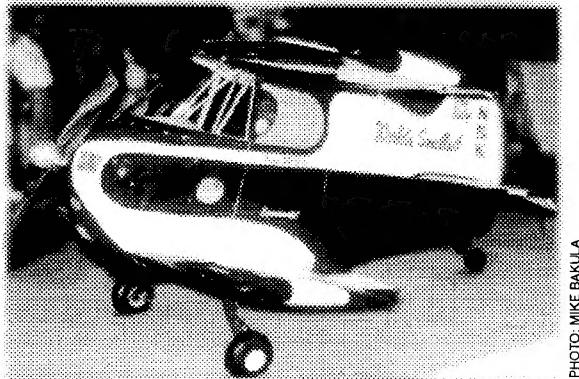
PHOTO: MIKE BAKULA

One of the few FAA certified gyrocopters produced today.

Accord dangerously as she passes, yelling and giving me a thumbs-up sign. I thumbs-up back, and sigh in relief as she takes the next exit.

After Milwaukee, northbound on highway 41, I see the first Oshkosh sign; "EAA Fly-In, tune 1630 AM." I do, and it's a canned info loop, (kinda like an ATIS for drivers), explaining which exit to take for camping, which one for parking, price information, and welcome blurbs. Well produced and useful. I take the exit for Camp Scholler (the EAA camp on site) and get into line for entry. I'm surrounded by 30 to 50 foot campers, some towing cars, most with various modifications (DBS satellite dishes, extended awnings, minibikes on racks). It's a 20 minute wait, with the line moving well, to get to the camp entrance.

At the entrance, they're processing 5 lanes, getting campers registered, plus a bypass lane for people to go in and out. From the gate, it looks like there's quite a bit of room in the campground. I pull up, register for camping and get my flight-line pass for the week right there. Cost is ~\$200 and takes 5 minutes. They have it down to a science. There're no badges — my flight-line pass is a plastic bracelet, specially printed, and difficult to remove.



The world's smallest flyable airplane

They tell me it's non-transferable and non-replaceable. I put it on, and leave it on for the week. (When I get home, I have to cut it off to remove it.)

Back in the car, I put the campground pass in my window ("don't lose it, it's like cash") and drive past the "badger" at the gate. The campground is first-come first-serve; and, being only a day early, I'm not the first. The campground is already 2/3 full, some people having been here a week before I've arrived. Still there's spaces here and there, depending on how hard you look. I drive around for about half an hour, before finding a spot that's between two other tents about 3/8 mile from the airport gate. This is good, since some people were camping up to two miles from the gate! I'm fortunate because the space is too small for a motor coach. I set up my tent and go exploring.

The grounds are filled mostly with campers of various sizes and types. Some groups have gotten together and made group encampments which look real comfortable. Along the access road, there are a number of shower buildings, with running water (taps and fountains) and shaving stations set up on the outside (outlets and mirrors). Later in the week I use one of these to recharge the batteries on my cell phone. There are also phones and even a pop machine at each shower building. Bathrooms are strictly the portable units — but they're *everywhere*. I see honey wagons the size of semis on the access road, and when I use a portable toilet, it's usually been recently cleaned.

Overhead, I keep seeing an old Bell model 300 helicopter, all plexi and red-painted trusswork. It, along with a blue & white Jet Ranger, become a constant background noise; the nearby pioneer airport (more on that later) is giving

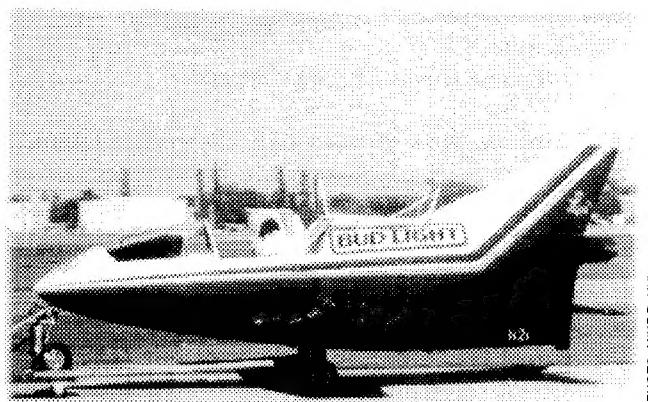
rides throughout the week, and to stay clear of the pattern over the runways, they fly over the campground and parking lots.

I'm beginning to wonder, "where the heck is the airport?", when I make it to the south gate & flightline access.

It's airplanes as far as the eye can see.

There's a forest of vertical stabilizers where they've parked some 50 or so VariEze's, Cozy's, and other Burt Rutan-designed or -derived canard aircraft. Behind them are no less than three B-17's, and a bunch of other WWII bombers and cargo planes, with jet fighters in between. Behind them, aerobatic planes, and then the main flightline, with literally hundreds of homebuilt aircraft, all tied down in rows going down the runway and past the tower out of sight. It's overwhelming.

At wide intervals between the planes are various small buildings and tents. Some are airport services (communications, airshow operations, volunteer ops); others are restaurants, or souvenir shops (where to get film, or your Intl. Aerobatic Club T-Shirt); there are also the ubiquitous porta-johns, in neat rows around the periphery. The aircraft are grouped into broad sections; warbirds at the north end, then custom homebuilts (the largest section), then classics (usually aircraft built before WWII), and way out at the south end, ultralights and rotorcraft. (This because they flew in and out without tower control, like the chopper rides.) Outside of these groupings, way out off the south end of the main north/south runway (18-36) and along the secondary runway (9-27) there were people who had flown in to camp, usually in regular general aviation aircraft. On the far (north) side of 9-27, there was transient parking for



The world's largest flyable toy jet.

people who would fly in for the day to see the show. This ran the length of the east-west runway, and was full most of the week.

I started walking north up the flightline, checking out the

planes and getting my bearings; soon I got to the tower & exhibition area. There were three exhibition hangars, full of booths where dealers sold everything from jewelry (mostly not very good) to complete aircraft (though more of them were in the outdoor exhibition area). West of the exhibition hangars was the tower and some open workshop areas. The workshops taught welding, riveting, propeller carving and other practical skills for building aircraft. Further north, there was a series of tents set up for programming. I'd spend a good part of the next few days in those tents. Past them was the "fly mart," an aviation flea market and scrapyard for all your aircraft scrounging needs. It ended at the edge of the camping area south of 9-27.

By this time, it was getting dark, and I was getting hungry. There was a small camp store for the air-campers (there was at my campground), but I went into the Warbirds Cafe (a large clear-plastic sided tent) for a rest and some dinner. The fare was basically Burger King, but it was cheap and hot. I hung out there awhile, watching people and planes go by, until after dark. When I headed back to my campsite, the stars were out, and the tarmac lights silhouetted streamlined aluminum and fiberglass.

Thursday, 27 July

I woke up at dawn, to the sound of propellers.

Extracting myself from my little bubble tent, I looked up to find a B-17, escorted by four P-51/D's flying over the campground. (Apparently they were just arriving from an air museum down south.) They circled a couple of times, then landed on 36. I got to see the bomber close up a little while later, on my way to breakfast. Since I was up, I walked the hundred yards to the shower building. I thought I'd get a shower before breakfast, figuring to beat the rush. (No dice; there was already a line.) After a short wait, I did get my shower, and the water was reasonably hot. (Note for those who go next year — take sandals, since the shower floor can get muddy.) That done, back to camp to get organized for the day. (Notebook, camera, hat, cash...)

I walked to the south gate, and this time there was a guard there; a young lady in a security uniform marked "EAA Police." She saw my bracelet and wished me a good morning. I never tried to find out if they were really police, but they basically performed con security functions for the week.

Also, the trams were running. Each of these consisted of a couple of bench trailers being pulled by donated John Deere tractors up and down the flight line. I caught one



The infamous GeeBee flies agian!

PHOTO: MIKE BAKULA

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back up to the Warbirds Cafe, since it was open early, and close to the forum tents. I got breakfast (eggs & bacon), then over to tent #2 for the first forum, "Optimum Wing Planform" with Reg Finch.

It turned out to be a freshman-level seminar on converting the 2D aerodynamics of wind tunnel tests into a 3D domain for estimating the actual performance of real wings. He kept the math reasonable through the use of a Newtonian view of what the wing is doing. (I have fairly extensive notes for those who want the gory details) At the end, he spoke about a few wing planform and wingtip innovations, named after himself, based on MIT wind tunnel studies and actual modifications of general aviation aircraft. He also had papers available on these, which I purchased. His discussion centered on how to account for aspect ratio in wing design, and the relative lift profiles of rectangular, tapered, and elliptical wing planforms, and was quite understandable, at least to me. I should also note that there were about 100 people in the tent, at 8:30 in the morning. These guys are serious!

I had a break before the next forum, so I wandered through the outdoor exhibition area. This is where the major kit manufacturers, general aviation aircraft companies, and pilot organizations had their displays. Going by the activity, homebuilts and general aviation are a growing thing these days! There were people at every tent, and every display aircraft, whether complete or partial, had a number of people looking at, poking, and prodding it.

The kit manufacturers usually had two displays; one of a completed aircraft (some, like the Kitfox folks, would have more than one), and one partially completed plane with the structure exposed for inspection. I got a number of pictures of design details and ideas from these displays. Many of them also had video presentations and information packs. These usually ran \$15-20, and, I suspect, form a significant revenue stream for a kit manufacturer, since a lot more people were getting information than were dropping \$10,000 or more on a kit. I limited myself to the free one-sheets. It was starting to get hot, so I picked up a coke.

Back at the forum tents, another session was starting. Again it was tent 2, but the subject was "VW Based Engines for Aircraft Use." This was more of a practical question-and-answer thing for people who were already familiar with these engines. Fortunately, I've messed with bug engines before, and got some good tips on using them with light airplanes. The trick is mostly, don't push them too hard. The people who were having problems seemed to be the ones that had done racing conversions on their

blocks, then tried to run them continuously. I got references for how to attach props to the crankshafts and other notes. There was a good deal of discussion between the audience members, as well as with the guys up front.

The session ended about 13:00, so got some lunch, and checked out one of the exhibition hangars. There I found a cheap scanner, and a list of (some) of the active frequencies for flight operations. There was constant, dense traffic whenever I turned it on, except during the air shows.

Back at the forum tents, one of the main programs I wanted to see was starting — “Composite Basics.” They went through the basic characteristics, advantages, and limitations of fiberglass, carbon fiber, and kevlar composite structures. Some of the high points from my notes:

- Expect about 40K psi compressive and 50K psi tensile strength from glass fiber or carbon fiber structures built under home workshop conditions. (Commercially available pre-made carbon-fiber elements can exceed 120K psi tensile.)
- Water is your enemy, particularly in glass or kevlar laminates. Take precautions to prevent water contamination before laying up a part.
- The straighter you can get your fibers (nonwoven fibers, satin weaves instead of cross weave), the stronger the resulting laminate will be *in the direction of the fibers*.
- The foam in most composite wing structures is subjected to only 1-5 psi of shear.
- Cheap polyester resins have low strength. Aircraft structures use epoxies or vinyl esters.
- Vinyl ester resins use styrene monomers as solvents. They eat styrofoam.
- All the epoxies and resins use poisonous solvents. YOU MUST WEAR GLOVES AND HAVE EXCELLENT VENTILATION WHEN USING THEM. The organic solvents' effects are cumulative, and can be deadly.
- Styrofoam softens at about 140° F. Some epoxies and esters soften at about 200° F. Black-painted surfaces backed with styrofoam can exceed 300° F. in direct sunlight. Paint your aircraft accordingly...

There's more, but really, the best way to get all the details is to look at the book *Composite Basics*, by Andy Marshall. I bought a copy, and it includes everything that was in my notes and more.

I spent the rest of the day ogling aircraft, and watching the airshow (which, by the time the forum ended, had been going for an hour). Again, by the time I got back to my tent, it was well after dark. I did some ground-school studying by Coleman lantern, then went for a late night shower. (There was still a line. Rats.) About midnight, I finally nodded off.

To be continued.



PHOTO: BARRY GEHM

Sheila Grey

by Bill Higgins

We've lost another good one.

On 31 May 1995 Chicago fan Sheila Grey (formerly Insley) died of a blood clot after multiple-bypass surgery.

I got to know her through the legendary Thursday night gatherings. They revolved among many Chicago hosts, but frequently touched down at the Insley home. Thursdays were a great opportunity to chatter about science fiction, science, or computers, and to meet all kinds of interesting people. The house on Wilson Street was a place where many General Technics schemes were hatched, fanzines were collated, and members were recruited. Very early on, word got around that Pete and Sheila didn't want to be known as "Mr. and Mrs. Insley," somebody's parents—they wanted to be "Pete and Sheila." Most of us took the hint.

Sheila easily became accepted as one of the fannish crowd, but it was just one of the circles she moved in. She worked in a law office. She was active volunteering for her church. She loved folksinging—or any kind of singing—and you could find her wherever the music was playing. She was a writer good enough to win the annual ISFIC story contest, polishing her talent in a regular workshop with other fledgling writers. She was a mom, and then a grandma, to an intriguing collection of kids, including GTers Alice Bentley, Alan Insley and Angel Johnston.

Over the years, she was never far from the nerve centers of fannish activity. When you walked into The Stars Our Destination, Chicago's SF bookstore, you'd often find Sheila behind the counter of the "family business." Or she might be working to run a local con. Or you might encounter her camping at a Berzerker Weekend. Over the years, we became close friends.

I'll miss her warmth and generosity. I'll miss her ready wit and mischievous smile. And I'll miss her voice. At a picnic two days before she died, I got out my uke and we sang a bunch of favorite songs together. That's how I'll remember

her: glad to be singing on a warm spring day.

"...Kids, Don't Try This in Your Parents' Microwave..."

**Jojo Bazilian, Amateur Technologist
(as told to Jon Singer)**

Here are some things we suggest you avoid doing with your microwave oven:

1) "Hatch the Alien"

Unwrap a large peppermint pattie and put it on a small plate. Put the plate in the microwave. Turn it on, full power, for two or three minutes. (You probably won't need that long; you can always press Cancel when you're satisfied.)

2) "99 & 44/100% Pure - It Floats!"

This is actually a variant of #1, for those who are pure of heart and clean of soul. Instead of a peppermint pattie, put a bar of Ivory (™) or Irish Spring (also ™) soap on the plate. I usually set the time for four minutes, as this one tends to run longer than #1.

3) "Mister Sta-Puft"

Take several large-size marshmallows. Draw a face on each, with an indelible marker (or anything else you can find that will actually write on a marshmallow). Array them on a plate. This time you want only half power.

4) "Beam Me Up, Scotty, There's No Data on this Planet Any More."

Make a small stand, perhaps as much as an inch tall. (Can be less.) Take a CD disk, any CD that you *never, ever* want to put in a player again, *ever*. Now comes the hard part: figure out how to replace the lightbulb for your microwave, and take the bulb out. (Granted, they don't make it easy, because they'd prefer that you buy a new microwave or at least pay someone lots of bucks to do it for you, but it has to be possible. Lightbulbs don't last as long as magnetrons. Usually.) Now: put the stand in the microwave and put the CD disk on it, clear side up. Turn off all the room lights, gather 'round, and give it 5 seconds (FIVE SECONDS) at full power. ...Then run #2, because you will want to clean your microwave: the overwhelming probability is that the awful stench is also poisonous. Besides, your microwave probably needs to be cleaned anyway. I know mine did.

[Editor's note: We didn't remove —I mean, if one were to try this (which Jojo does not recommend), one would not need to

remove the light bulb inside one's parents' oven. Covering it with a piece of cardboard would obtain satisfactory darkness. The rather wonderful display would be over long before you had any concern about cooking the cardboard. A good choice for the sacrificial CD is a free CD-ROM containing PC software, such as Prodigy or America Online insist on mailing to Macintosh owners. Check your mailbox. Otherwise contact a local disk jockey for unwanted CDs.]

...There are more of these, but I can't remember any of 'em right now.

My sincere thanks to JJ Mars and Bo Fellinger for the first three of these—it has been long enough that I don't remember for sure, but they're certainly likely suspects—and to Ron Chick for #4.

Cheers!

Henry's Scary Stories of Spaceflight #2:

John Young Lands STS-9

Henry Spencer

(I should make a small disclaimer here: different sources disagree on some of the details of this story, and I haven't yet seen a single authoritative account. The following is my attempt to put the pieces together.)

At the end of November 1983, shuttle orbiter Columbia carried the first Spacelab mission into orbit. By this time, the shuttle was officially an operational system, and various aspects of the hardware were supposedly settling down; for example, this flight made the first operational use of the TDRS data-relay satellites. The launch was delayed somewhat by an SRB nozzle problem, but after that everything seemed on track. Indeed, for the first nine days of the flight everything ran smoothly.

On the tenth day, reentry day, things got exciting. First, general-purpose computer number one (GPC 1) crashed for no obvious reason. Some eyebrows were raised because the crash happened at exactly the time of a thruster firing... but there was no obvious connection. The mess was compounded because GPC 1 managed to leave some garbage in memory, which confused and crashed GPC 2.

Landing was postponed for a few hours while engineers tried to sort things out, without very satisfactory results.

GPC 1 now checked out just fine. Nobody could find any reason why it should have crashed during the thruster firing, or for that matter at any time. All the engineers could do was to assume that it was just happenstance, and proceed.

One precaution was taken before landing. The different computers don't all do the same jobs. In particular, certain

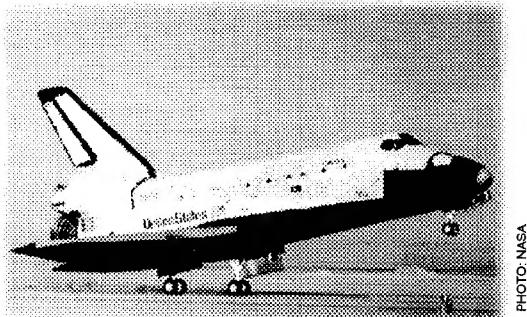


PHOTO: NASA

STS-9 narrowly escapes disaster.

functions are normally assigned to the first three only. So, with the finger of suspicion still pointing at GPC 1, the hardware was cross-connected so that GPC 1 was running the less-critical systems normally assigned to GPC 4, and vice versa. Okay so far...

The computers all behaved themselves during reentry. But on touchdown, GPC 1 crashed again. Now, at this point, GPCs 1-4 were running the orbiter controls, one on each of four hydraulic systems. Having one computer among four fail was obviously a possibility, so the hardware was designed to cope with it, in three ways in fact. First, and most obvious, with three hydraulic systems pushing one way and one pushing the other way, the three good ones simply overpowered the bad one and maintained control in spite of it. However, this is a bit hard on the hydraulics, so the control system is designed to eventually detect such battles and automatically disconnect the bad system. Finally, the astronauts are supposed to detect such situations and shut off the bad hydraulic system.

So John Young, who was in command, saw the "computer crashed" light on GPC 1 and shut off hydraulic system 1... which was being run by GPC 4!

Now there were three hydraulic systems in control of the orbiter, one of them being commanded (or rather, not commanded) by a dead computer. You'd think this would still be safe. Except that there was a known bug in the auto-disconnect equipment: in some situations involving 2:1 imbalances (as opposed to the usual 3:1) and large control movements, it could get confused and kill the wrong hydraulic system, yielding a 1:1 deadlock and frozen controls.

As it actually happened, since GPC 1 crashed at touchdown and Young's little goof followed that, the

orbiter was already on the ground. There was no further need for large control movements, the auto-disconnect did its job properly, and the orbiter stayed under control.

But nevertheless, this was a pretty close shave. It wasn't an accident that the computer crashed when it got jolted, first by a thruster firing and again by touchdown. Commercial packages for electronic chips encase the chip in a blob of plastic, but that can cause problems at temperature extremes, because the coefficients of thermal expansion of the plastic and the fine wires that connect to the chip are very different. So military/space chip packages have the chip and its wires sitting inside a little hermetically-sealed cavity, with only thicker and tougher leads going through the surrounding package material. On a few of the chips in Columbia's GPCs, there were little solder balls rattling around loose inside the cavities. Bump the computer, and they shifted around... and once in a while they'd settle in a position where they shorted something out.

All it would have taken would have been a bit of turbulence a few seconds before landing. GPC 1 would have crashed then, instead of at touchdown. Young would (probably) have made the same mistake. The large control movements needed in the turbulent air would have confused the auto-disconnect. And the controls would have locked up, at the exact moment when the orbiter needed to be pulled up hard to reduce its headlong descent rate. Columbia would have ended up as a smoking hole in the ground.

John Brunner, 1934-1995

Barry Gehm

If working on the Intersection fireworks display was the high point of the convention for many of the GTers attending the Scottish Worldcon (see Linda Tangalan's article in this issue), surely hearing of the death of John Brunner must have been the low point. Mr. Brunner was attending the convention when he reportedly suffered a stroke (some later reports say a heart attack), and died a short time later in a nearby hospital.

As a thoughtful and prolific writer of social sf, Mr. Brunner had a major impact on the science fiction field, and his death is a loss to all readers of sf. But he had a special place in the hearts of General Technics, since we took our name (with his permission) from a high-tech corporation in his most famous novel, *Stand on Zanzibar*. Although his General Technics sometimes displayed a ruthless corporate ethic consistent with the novel's dystopian world-view, it also evinced a breadth of scientific and technological interest that justified its name and which, I think, our General Technics rightly aspires to and perhaps even attains. To quote one of GT's recruiting

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DON'T READ THIS, JUST SIGN IT

Tullio Proni

[*Founding GT member Tullio Proni was Mad Scientist Guest of Honor at DuckKon last year, and gave a memorable demonstration of the sort of experiments he conducts in his basement laboratory. Given the litigious spirit of the times, Tullio wisely required all attending to sign the waiver below. Considering the project descriptions PYRO sometimes prints, maybe we should require all our subscribers to sign a similar form...]*

LEGAL WAIVER

I, _____ agree to hold Tullio Proni, DuckKon, the Lisle Hyatt Hotel, the County of DuPage, the State of Illinois, the United States of America, the United Nations, and all entities, persons, or small furry creatures subject to their rule, control or influence as well as all agents, employees, or associates of these and other organization, associations, fraternal orders, secret societies and beings on this and other planes, parallel universes, and alternate time lines **TOTALLY, completely, universally, and with no equivocation, conscious or unconscious, BLAMELESS** for anything that may or may not result as a consequence of my attendance at this lecture. I further declare myself totally culpable for my actions, speech, thoughts, and/or vague feelings of unease which I may experience during or after this lecture, as well as anything else that may or may not occur as a result of this lecture and demonstration.

I do all of the above with a full understanding that I may be subjected to patterned sonic waves in the range of 20-20,000 CPS, particle/wave emissions of a broad band, and whole body sensory stimulation. I also waive any claims, damages, or judicial remedies to which I may otherwise be entitled as a result of exposure to any of the following: ozone, plasma discharges, radiation (both ionizing and non-ionizing), toxins, electromagnetic fields, ozone, mutagens, shock waves, EMF, planetary collisions, unstable isotopes, unstable individuals, unstable bowls of really hot soup, ozone, UV radiation, ballistic projectiles, explosives (conventional and nuclear), neurotoxins, large pointy things, earthquakes, explosive vapors, piranhas, bad thoughts, variations in atmospheric pressure and content, elements 1 through 109, sub-ether vibrations, comets, viruses (computer and biological), ozone, electrical discharges, SMOFS, carpet tape, piezo-electric crystals, time shifts, all other elements, virtual reality, full reality, totally unreal duds, techies, lasers, masers, charged particle beams, fusion (hot and cold), ozone, stories of the "good old days," neutronium, radar, Venus flytraps, petroleum products, bad karma, cyclotrons, magic, Magic the Gathering, clip leads, toy robots, white death, black death, ozone and knowing too much.

While attending this event I take full responsibility for any action I may perform. This includes but is not limited to all actions performed by my body while my mind is present, actions performed by my mind with my body not present, and actions performed by my body while under the control of mad scientists, extraterrestrials, hideous beings from the lower depths of hell or from before the dawn of time. Should I possess or be possessed by another being I waive all rights to blame anyone other than myself for exploring secrets that Man was not meant to know.

I attend with the full knowledge that heavy things hurt if they fall on you, and while jolts of high voltage may occasionally bring the dead to life they are much more reliable in bringing death to the living. ICs do not normally run on 15,000 volts; "stand back" does not mean move in for a better view, hot things will burn you, and bad things do not happen just to the other guy. In addition I swear that I will not bring any object or creature that may harm others or may in turn be harmed by others to this event. This includes but is not limited to: radios, cordless phones, CBs, digital watches, anti-tank missiles, photographic film, blasting caps, tape recorders, electric eels, elder gods, tear gas, LPG, bastard swords, legitimate swords, ferrets, slingshots, shot-puts, solder pots, flammable pajamas, nitrocellulose, pit bulls, talk show hosts, magnesium wheels, and fanatical beliefs.

I also promise not to divulge any secrets I may learn to any soul living or dead, nor to any soulless being or AI without first forgetting its source and filing off all serial numbers. This also refers to anything I may learn or believe that I have learned at this lecture including but not limited to the construction of miniature black holes, Tesla coils, starships, drill presses, rayguns, anti-matter, secret organizations, surge generators, gates to alternate universes, urban tunneling, hideous laughter and shield generators. If I should violate the terms of this waiver I realize that I am totally and truly DOOMED. I accept that I may be subject to prosecution and persecution by all agencies of this and all other worlds including the FBI, CIA, IRS, KKK, KGB, and other acronyms too hideous to contemplate. In fact to make matters easier on all concerned I promise to spontaneously vaporize at the mere thought of violating any of the terms in this waiver.

I swear that my will is in order and that I will not be missed if I mysteriously disappear.

Signed _____

Bank account number _____ PIN # _____

beware of tiny type

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ads in Stand on Zanzibar:

When we say "general" at GT we mean GENERAL. We offer the career of a lifetime to anyone interested in aeronautics, biology, chemistry, dynamics, eugenics, ferromagnetism, geology, hydraulics, industrial administration, jet propulsion, kinetics, law, metallurgy, nucleonics, optics, patent rights, quarkology, robotics, synthesis, telecommunications,

ultrasonics, vacuum technology, work, X-rays, ylem, zoology... No, we didn't miss out your speciality. We just didn't have room for it in this ad.

John Brunner, namegiver of General Technics. Raise a glass to his memory, or better yet, read some more of his books.

PyroTechnics

The Now & Then Newsletter of General Technics

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PYROTECHNICS gleefully accepts contributions in the form of art and articles. If at all possible, text should be 10 pt, formatted 3-1/2 inches wide and justified. PLEASE!! If you go to the trouble to format it, make sure that your finished copy is BLACK. Electronic submissions are very welcome. We can read IBM, Macintosh and 8-bit Atari diskettes. Most word-processor formats are OK (MS Word preferred) but please include an ASCII version as well. Submissions can also be made by e-mail to pyro@mystery.com.

Contributions of art can consist of cartoons, fillos, photos, etc. We prefer good black photocopies to original art.

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